IN THE SPECIFICATION

Amend pages 3 & 7 as indicated on the enclosed copies of same.

as a monolithic bed. It is important that whichever the monolithic bed, the components be arranged as to not move about, e.g., in the high flow fields of a rocket, thereby attriting.

By "calcining" as used herein, is meant, heating the doped catalyst base in an oxidizing or reducing atmosphere, e.g., in air, H_2 or N_2, without burning same, to form the activated catalyst of the invention. Thus Mn is suitably calcined in air, at, e.g. 450° C.

The doped catalyst base is calcined, e.g. in air, to form metal oxides of the catalysts doped thereon, to cause H_2O_2 to more readily decompose by lowering its activation energy, E_a.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more apparent from the following detailed specification and drawings in which;

Figure 1 is a partial perspective schematic view of a catalyst pack 10 embodying the present invention;

Figures 2, 3 and 4 are sectional elevation schematic views of rockets having propulsion systems which include catalyst packs embodying the present invention and

Figure 5 is a fragmentary sectional elevation schematic view of another catalyst pack embodying the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring in more detail to the drawings, Figure 1 shows a catalyst pack 10 embodying the invention in a rocket housing 12 and held closely in place between two end screens 14 and 16 in such housing.

The catalyst pack embodying the invention is made according to the following process per the invention:

1) A high surface area, ceramic catalyst base, e.g. in pellets or spheres, commercially available, is obtained. Suitable materials are alumino-silicates, alumina, silica, activated carbon or other ceramic refractory oxides.

2) A catalyst cation loading is calculated based on a defined mole percentage of the final cationic species. As an example, a typical loading can be 1% w/w of manganese (+4) on a zeolite molecular sieve (ZMS) .

3) A soluble salt of the desired cation is placed into a defined quantity of solvent; this is poured over the catalyst base in an amount sufficient to totally wet the catalyst base in bulk.

4) After a suitable equilibration time, (e.g. 10-60 mins or more) the solution/base system is dried in a vacuum oven to remove the solvent.

eroding the interior thereof) forming a hybrid jet stream which flows through nozzle 52 and out of the rocket 40, to propel such rocket 40, as shown or indicated in Figure 4. Advantageously, the jet of rocket 40 can be shut off by closing valve 56 and later restarted by opening such valve.

In the example of Figure 3, rocket 60 has a tank 62 of pressurized helium, valve 64, a pressurized tank 66 of H_2O_2, flowline 68, valve 70 and catalyst pack 72 mounted adjacent combustion chamber 74, as shown. Rocket 60 also has a tank 80 of liquid fuel, which is connected, at its forward end, by line 82 and valve 84 to the tank 62 of helium and at its aft end, by fuel line 86 and valve 88 to fuel injectors 90, as shown in Figure 3.

In operation, the respective valves 64 & 70 and 84 & 88 are opened causing the flow of H_2O_2 through the catalyst pack 72 and the flow of liquid rocket fuel through the fuel injectors 90, where fuel and decomposing H_2O_2 unite in powerful combustion, emitting a jet stream 92 out of the combustion chamber 74 through discharge nozzle 94, as shown in Figure 3.

Thus various uses of the catalyst pack of the invention, in various shapes, in various rocket systems are indicated.

Referring back to Figures 2 ~~and~~ -4, a more detailed catalyst pack is shown in Figure 5. Thus catalyst pack 162, mounted in rocket housing 160, has basket 164, holding activated catalyst pellets 166 per the invention securely in place, as shown in Figure 5. Inlet feed line 168 and valve 170, admit H_2O_2 to the catalyst pack 162 as inlet jet 172, which jet flows through and by the pellets 166, causing vigorous decomposition of H_2O_2 to steam and 0_2. Such reaction results in, e.g. a 1000 to 1 increase in volume and a reaction temperature of, e.g. 1200° F, such that a high pressure jet 174 emits from discharge nozzle 175 to propel, e.g. the rockets of Figures 2 ~~or~~ -4, as indicated in Figures 2, 3, 4 and 5.

The catalyst pack of the invention can also be employed as a gas generator, e.g. as indicated in Figures 2 ~~and~~ -4 hereof when the rocket is held in place.

Thus the present invention provides a high surface area catalyst pack employing a porous ceramic, high surface area base impregnated or doped with an active cation catalytic agent which is highly effective in the decomposition of H_2O_2.

In sum, the activated catalyst of the invention includes

a) a porous catalyst base doped with

b) a catalytic agent that is a calcined cation

and if desired,

c) a catalytic promoter.